still, of course, remains to show *how* the homoplasy has been brought about. In some cases, as in the homoplastic forms of American Cactaceæ and South African Euphorbias, or in the stipular bud scales of many wholly unrelated deciduous trees, the nature of the similar external conditions may possibly be made out with some correctness. Again, Dr. Seemann has pointed out that by the rivers in Nicaragua and in Viti, the vegetation, although composed of very different plants, puts on the willow form ("Dottings by the Roadside," p. 46). A phenomenon true of two distant places accidentally contrasted, might be expected to obtain more generally; at any rate, among our indigenous riparian plants *Lythrum Salicaria* and the willow-herb are, as their names indicate, additional illustrations. The band of vegetation that fringes a stream is always densely crowded with individual plants, and it is easy to see that elongated and vertically disposed leaves would be most advantageous, exactly as they are to the gregarious plants of meadows and plains. The homoplastic agreement of riparian plants may be therefore a direct result of selective effort due to the position in which they grow.

In other cases the operation of similar external moulding influences is not so easy to trace. It might, perhaps, however, be imagined that plants would hereditarily retain the effects when the influences had ceased to operate, and no new ones had come into operation precisely adapted to obliterate the work of those that preceded them. Suppose, for example, that willows got their habit and foliage from ancestors that were exclusively riparian, then any descendant that happened to be able to tolerate situations with less abundant supplies of moisture, would not necessarily lose their characteristic foliage on that account. Such races might be expected to occur near rivers subject to periodic droughts, since under these conditions any others would be likely to perish. Under such circumstances we should have cause and effect no longer in contiguity; the riparian habit surviving the riparian situation.

I suggested at Edinburgh that possibly similar habits in plants might be brought about by *different* causes. This was only a suggestion, and probably what has just been said is a truer account of the matter. At any rate the illustration I gave of my meaning has been quite misunderstood (as, for example, in the last number of the *Popular Science Review*). It is well known that there are a certain number of plants indigenous to the British Isles, which are found at a considerable height upon mountains and also upon the sea-shore, but not in the intervening space. In the latter situations they contain more sodium salts than in the former, and inasmuch as these salts are destructive to many plants, those that compose a strand flora must be able to tolerate them, and this of course is an advantage, because many of their competitors are poisoned off. Similarly plants of mountains must have a similar advantage over others in ability to tolerate mountain asperities of climate. Now, suppose a mountain submerged; its flora and certain portions of that of the strand come to coincide. Then if we suppose the mountain gradually to emerge, some of these plants will spread downwards under the uncovered surface, and travel over the whole of the interval that ultimately separates the mountain-top and the strand. Why, then, do they not remain there? Simply, I believe, because they are elbowed out by other plants which, nevertheless, cannot tolerate the conditions of life either on the mountain or the shore, and leave these, therefore, as refuges which they are unable to invade. It is possible that the action of similar soil constituents might help to bring about homoplastic agreements in plants. The suggestion is not, however, one that occurred to me to make. My object was simply to show how two perfectly different causes might produce the same effect, namely, that of giving immunity from competition to a small group of plants. Except as an illustration of this point, the matter was quite irrelevant to the subject about which I was speaking.

W. T. THISELTON DYER

ON THE DISCOVERY OF STEPHANURUS IN THE UNITED STATES AND IN AUSTRALIA

THE time has now arrived when a full statement of the facts relating to this interesting parasite, *Stephanurus dentatus*, should be made more generally known; for not only is the progress of helminthological science likely to be checked by delay in this matter, but, in the absence of definite information, the several merits of the original discoverer and describer of this entozoon are likely to be altogether ignored. I therefore record the facts and inferences in the order in which they have recently come under my notice.

On the 10th of January last, through the firm of Messrs. Groombridge, I received an undated communication from Prof. W. B. Fletcher, of Indianapolis, Indiana, U.S.A. In that letter Dr. Fletcher announces that he has "found a worm" infesting the hog, and he helps one to realise its abundance by adding that he obtained it "in nine out of ten hogs" which he examined. After recording some other important facts respecting the tissues and organs which were most infested by the parasite, Dr. Fletcher remarks that he cannot find any description of the worm in the work on Entozoa issued by the publishers above mentioned, nor in the writings of Von Siebold and Küchenmeister, and he therefore encloses specimens for my determination, requesting a reply.

As I have already stated in my first letter recorded in the *British Medical Journal* (for January 14, p. 50, where many other particulars are given which I need not here recapitulate) I was instantly struck with the "strongyloid character" of the fragmentary and shrivelled up specimens, and I may also add that it at once occurred to me that I had had some previous acquaintance with a scientific description of the worm. Proceeding, therefore, to turn over a series of helminthological memoirs, for many of which I stand indebted to the late veteran, Dr. K. M. Diesing, of Vienna, I soon had the good fortune to find the desired record. The memoir in question forms part of the "Annalen des Wiener Museums" for 1839, the full title being "Neue Gattungen von Binnenwürmern, nebst einen Nachtrage zur Monographie der Amphistomen."

As this work is probably little, if at all, known in the countries now necessarily most interested in the history of this entozoon, I cannot, perhaps, do better than transcribe Dr. Diesing's brief notice of the original discovery, together with his description of the external characters presented by the worm. After naming the parasite *Stephanurus*, on account of the coronet-like figure of the tail of the male, and giving a technical description of the species, he continues as follows:—"At Barra do Rio Negro, on the 24th of March, 1834, Natterer discovered this peculiar genus occurring singly or several together in capsules situated amongst the layers of fat, in a Chinese race of *Sus scrofa domestica*. Placed in water or in spirits of wine, they stretched themselves considerably, and almost all moved up and down."

"The males measure from ten to thirteen lines in length, the females from fifteen to eighteen lines, the former being scarcely a line in breadth at the middle of the body, whilst the latter are almost a line-and-a-half in thickness. The curved body thickens towards the tail, is transversely ringed, and when viewed with a penetrating lens, is seen to be furnished with integumentary pores. The oral aperture opens widely, and is almost circular; it is supplied with six marginal teeth, two of which, standing opposed to one another, are larger and stronger than the rest. The tail of the male, when evenly spread out, is surrounded by a crown of five lancet-shaped flaps; the combined flaps being connected together from base to

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apex by means of a delicate transparent membrane. The single spiculum situated at the extreme end of the tail, projects slightly forwards, being surrounded by three skittle-shaped bodies. The tail of the female is curved upon itself, rounded off, and drawn out at the extreme end into a straight, beak-shaped point, whilst to both sides of the stumpy caudal extremity of the body, short vesicular elevations are attached. The female generative opening occurs at the commencement of the second half of the body.

"Judging by its external characters this genus is most closely allied to Strongylus."

The above description is supplemented by a more lengthened account of the internal organisation of the worm; this part of the record displaying in an especial manner those powers of accurate observation which so fully characterised the great systematist in helminthology prior to the time when he was deprived of his eye-sight.

Having communicated to Prof. Fletcher my views respecting the true history and identification of *Stephanurus*, he was pleased to supply me with some further particulars. Thus, (after receiving my reply) in his second communication (dated from Indianapolis, February 22), he says: "I at once renewed my researches, and was rewarded by finding the little saw-like teeth, upon a six-sided jaw, and, if I mistake not, two larger teeth or hooks. I also removed the lungs, heart, and liver, entire, from several hogs (just killed by shooting in the head) and found the worm, as before stated, in the liver, in all the hepatic vessels, and also in the vena cava. In some cases I found the eggs in abundance in the pelvis of the kidney, and in the urine, even when I could discover no cysts or worms about them."

Dr. Fletcher then alludes to the circumstance that he had since his first letter to me placed himself in correspondence with Prof. Verrill, who, it appears, had previously examined the worm. Prof. Fletcher also obligingly enclosed Prof. Verrill's paper, extracted from the *American Journal of Science and Arts* of September 1870, and, in so far as I may be guided by its contents, it would now appear that the very first specimens which were obtained in the United States were the "five" examples sent by Dr. M. C. White, of New Haven, U.S., to Prof. Verrill, who adds:—"In the second instance, at Middleton, Conn., Dr. N. Cressy found large numbers of the worms in the fat about the kidneys of a young Suffolk pig, brought from New Jersey."

The title of Prof. Verrill's paper is, "Description of *Sclerostoma pinguicola*, a new species of entozoa from the hog."

At this point I pause to remark on some of the more practical questions connected with *Stephanurus*, for it must be quite obvious that so large a parasite, comparatively speaking, must, when present in great numbers, give rise to a great amount of disease, even if it should not ordinarily prove fatal. Dr. Fletcher, indeed, does not hesitate to write as follows:—"It is my opinion that this parasite is the cause, in some way, of the hog cholera, which has created such sad havoc within the past ten years, over the pork-producing parts of America. One farmer told me a few days ago that within a month his loss alone from this cause was over one hundred head; and sometimes, in one neighbourhood, in a few days time, thousands have perished, although this season is not a cholera year, as our farmers say. I advised one farmer to burn or bury the dead animals; but he informed me that he believed that fewer hogs die of the disease after eating the dead animals than those kept from them. Unfortunately, in this State there is no law guarding the spread of disease, neither is there any reward of reputation or gain for pursuing any investigation that would bring pork and beef packers into disrepute. I myself could not get a pig's kidney or beef's liver in our city market, because I made investigations in some Texas cattle (being cut up in our market) which damaged their sale a few years ago." In a third letter Dr. Fletcher tells me that greater facilities for examining the carcases of hogs had since been accorded him through the liberality of a Liverpool firm of pork packers, who had already killed 75,000 hogs during the summer season, *i.e.*, up to the date of the first week in July. In hot weather the slaughtering is conducted in ice-houses.

These practical observations by Dr. Fletcher appear to me to be of the highest importance, even though it should eventually turn out that there is no immediate connection between the occurrence of *Stephanurus* and the hog cholera epidemics. That this opinion rests upon substantial data seems probable from the circumstance that we have now not only received evidence of the occurrence of *Stephanurus* in Australia, but we are further apprised that the pigs which harbour it die of the disease superinduced by their presence. As I have already stated, in my second letter, published in the pages of the *British Medical Journal*, our earliest intelligence on this point rests upon the evidence furnished by a series of unnamed slides transmitted from Sydney to the President of the Royal Microscopical Society of London. Through the kindness of the Society's able Secretary, Mr. Slack, F.G.S., I was permitted to examine, identify, and name all the specimens, and it was then that I recognised *Stephanurus* amongst the number.

On the 4th inst. Dr. Morris's paper, which accompanied the specimens, was read to the Society. In that paper the author, like Prof. Verrill, expresses his belief that he has found a new entozoon, "its habitat being the fat surrounding the kidney of the pig." He speaks of it as occurring both in the "free and encysted state, the encysted being its final stage of existence," and, he adds, "its solid parts ultimately disappear, leaving a greyish brown fluid containing thousands of eggs." Those who desire further particulars in reference to the parasitism of pigs and sheep in Australia should consult Dr. Morris's paper, which will appear in the forthcoming November number of the *Monthly Microscopical Journal*. Dr. Morris speaks of the pigs as dying from some mysterious disease, and thinks "it is possible that this worm or its brood may be the cause." In some cases their death takes place quite suddenly, and this he supposes to be due to peritonitis set up by the swarming and migrations of the progeny. Be this as it may, it is interesting to notice the remarkable corsespondency of the conclusions arrived at by Dr. Fletcher and Dr. Morris independently. It will probably not be difficult to ascertain hereafter whether or not the maladies respectively termed "Hog Cholera" and "Mysterious Disease" are one and the same disorder; but whatever happens in this respect, it is now quite clear that this parasite, hitherto little regarded, and for many years past persistently overlooked, is extraordinarily prevalent in the United States, and, perhaps, equally so in Australia, it being further evident that its presence in the flesh of swine is capable of producing both disease and death. The statement of the worthy American farmer that the swallowing of infested flesh by a pig does not necessarily involve the pig-eating hog in a bad attack of a so-called "Cholera disease" requires to be further tested, and it also remains to be proven whether or not the *Stephanurus* be capable of passing through all its developmental changes from the egg to the adult form within the body of the bearer without having at some time or other gained access to the outer world. The comparatively large size of the ova, which I find to be about $\frac{1}{300}''$, or more than four times the size of that of Trichina, is not without significance; but as yet we are unacquainted with the larval stages of growth. If no intermediary bearers are necessary to its development, we ought not to have to wait long for a complete record of the life-history of *Stephanurus dentatus*.

T. S. COBBOLD

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